

We claim:

1. A laser weld monitoring system capable of assessing a weld quality of welding using a laser, said system comprising:

5 at least one sensor capable of capturing a weld characteristic of welding using said laser, said weld characteristic having a plurality of attributes; and

 data acquisition and processing equipment adapted for storing and analyzing said weld characteristic,

10 wherein a user performs a plurality of welds to capture at least one weld characteristic for each weld, determines the weld quality of each weld, runs at least one of a library of algorithms associated with the attributes on said at least one weld characteristic for each weld to
15 generate a single value output for the associated attribute, and selects an attribute indicative of the weld quality by correlating the single value outputs of said at least one algorithm with the weld qualities of the welds.

20 2. The laser weld monitoring system according to claim 1, wherein the user performs the welds at different weld conditions to correlate a variation in the weld quality with the variation in the single value output for said at least one algorithm as the weld conditions change.

25 3. The laser weld monitoring system according to claim 1, wherein the user determines the weld quality of each weld by performing a physical testing.

30 4. The laser weld monitoring system according to claim 1, wherein the user determines the weld quality of each weld by performing a visual inspection.

5 5. The laser weld monitoring system according to
claim 1, wherein said at least one sensor includes at least
one selected from a group consisting of a photodiode, a
microphone, a monitor sensor, a plasma sensor and a machine
vision sensor.

10 6. The laser weld monitoring system according to
claim 1, wherein said weld characteristic includes at least
one selected from a group consisting of a reflection
signal, an IR signal and an acoustic signal.

15 7. The laser weld monitoring system according to
claim 1, wherein said attributes include at least one
selected from a group consisting of a maximum, a minimum, a
slope, an integration, at least one algebraic function and
at least one calculus function.

20 8. The laser weld monitoring system according to
claim 1, wherein said laser is selected from a group
consisting of a feedback laser, a non-feedback laser, an
Nd:YAG laser, a CO₂ laser and a green laser.

25 9. The laser weld monitoring system according to
claim 1, further comprising a CCTV camera capable of
capturing images of welding parts.

30 10. The laser weld monitoring system according to
claim 1, wherein the data acquisition and processing
equipment comprises a digitizer for processing said weld
characteristic, wherein said digitizer comprises at least
one selected from a group consisting of an oscilloscope, a

digital oscilloscope, a DSP board, a DAQ board and custom electronics.

11. The laser weld monitoring system according to
5 claim 1, wherein the library of algorithms associated with
the attributes have been predetermined by a developer of
said laser weld monitoring system.

12. The laser weld monitoring system according to
10 claim 1, wherein the library of algorithms associated with
the attributes are developed by the user.

13. The laser weld monitoring system according to
claim 1, wherein the system can be used for both process
15 development and process control.

14. A method of monitoring a weld quality of a laser,
said method comprising:

performing a plurality of test welds;
20 capturing at least one weld characteristic of
each test weld, said at least one weld characteristic
having a plurality of attributes;
determining the weld quality of each test weld;
running at least one of a library of algorithms
25 associated with the attributes on said at least one weld
characteristic for each weld to generate a single value
output for the associated attribute; and
selecting an attribute indicative of the weld
quality by correlating the single value outputs of said at
30 least one algorithm with the weld qualities of the test
welds.

15. The method according to claim 14, wherein performing the plurality of test welds comprises performing the testing welds at different weld conditions to correlate a variation in the weld quality with the variation in the single value output for said at least one algorithm as the weld conditions change.

16. The method according to claim 14, wherein running at least one of a library of algorithms comprises generating the single value output for at least one attribute selected from a group consisting of a maximum, a minimum, a slope, an integration, at least one algebraic function and at least one calculus function.

17. The method according to claim 14, wherein determining the weld quality comprises performing a weld strength test.

18. The method according to claim 14, wherein determining the weld quality comprises performing a weld interface area test

19. The method according to claim 14, further comprising defining good and bad welds based on the single value output of the algorithm associated with the selected attribute.

20. The method according to claim 19, further comprising:
performing a weld;
capturing the weld characteristic of the weld;
and

running the algorithm associated with the selected attribute on the weld characteristic for the weld to generate the single value output.

5 21. The method according to claim 20, further comprising determining the weld to be either a good weld or a bad weld by comparing the single value output for the weld with the definition of good and bad welds.

10 22. A method of adjusting a focus height of a laser, said method comprising:

performing a plurality of test welds, each test weld being performed at a different focus height about a predetermined initial focus height;

15 capturing a temperature characteristic of each test weld; and

determining the focus height that results in a maximum rising slope in the temperature characteristic as a correct focus height.

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